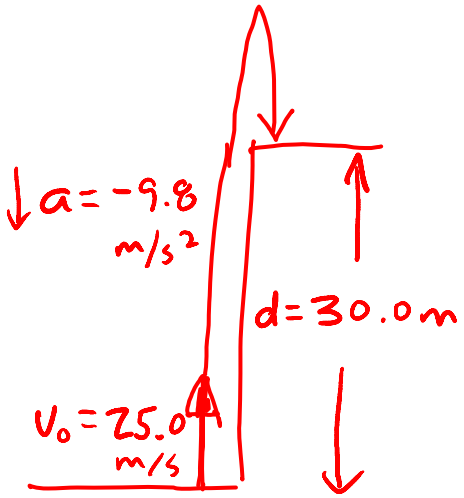
Example 3.
Wile E. Coyote wants to jump onto a cliff 30.0 meters high so, using his Acme spring-loaded tennis shoes, he jumps straight upwards at 25.0 m/s and safely lands on the cliff edge.

a) How long is he in the air?



$$d = v_0 t + \frac{1}{2} a t^2$$

$$30.0 = 25.0t + \frac{1}{2}(-9.8)t^2$$

⇒ to solve for t, must rearrange as $ax^2 + bx + c = 0$

$$4.9t^2 - 25t + 30 = 0$$

$$t = \frac{-(-25) \pm \sqrt{(-25)^2 - 4(4.9)(30)}}{2(4.9)}$$

$t = 1.93$ s → on the way up ✗
or
3.17 s → on the way down ✓

b) How high did he actually jump?

→ this time, use $v = 0$ with $v_0 = 25$ m/s and $a = -9.8$ m/s²

$$v^2 = v_0^2 + 2ad$$

$$0 = 25^2 + 2(-9.8)d$$

$$\boxed{d = 31.9 \text{ m}}$$